EUROPEAN VLBI NETWORK

JIVE
Joint Institute for VLBI ERIC

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EVN/JIVE Newsletter

IN THIS ISSUE

Welcome to the May 2026 issue of the EVN/JIVE Newsletter.

Dear readers of the EVN Newsletter,

It is with great pleasure that I present another issue of our newsletter, which, as usual, contains a wealth of important and interesting information from the scientific, technical, and social activities of our radio astronomy community.

The most important outcomes of our joint work are, of course, the results of scientific research. Once again, the EVN network can boast of remarkable discoveries that I briefly summarise here. An important discovery is the association of a repeating FRB with a weak radio source, bringing us closer to solving the mystery of these phenomena. Observations of blazar candidates with high angular resolution at high redshifts give us valuable information about the formation of massive black holes in the early Universe. Radio observations of the active galactic nucleus called AT2019aalc, which had previously been observed to exhibit specific optical bursts, have provided valuable clues towards solving the mystery of these bursts. Another important scientific result shows how radio interferometry can help solve the mystery of dark matter, which makes up about 85% of the matter in the Universe. Finally, we present interesting observations of the gamma-ray burst GRB 220627A, which likely underwent gravitational lensing. VLBI studies of the gravitational lensing potential may, for example, provide an independent determination of the Hubble constant.

In terms of technical innovations, it should be noted that EVN data will begin receiving DOIs (Digital Object Identifiers), which should significantly increase the visibility, traceability and scientific relevance of EVN data products, while also ensuring that the observatory and collaborating institutions receive due recognition. Another important development is the progress in the "White Rabbit" technique—the transmission of a precise time signal via a fibre-optic network. The latest low-jitter implementation allows interferometric observations to be conducted up to a frequency of 15 GHz, whereas it was normally only possible up to 3.5 GHz. I'm also very pleased to hear that Chalmers University of Technology in Sweden has received approximately €1.2 million from the Hasselblad Foundation to develop the tri-band receiver at the Onsala Space Observatory.

I would also like to remind you about the dozen or so upcoming events, the most important of which are probably the YERAC conference, the ERIS school, and the EVN Symposium.

Finally, I highly recommend, especially to younger readers, the interview with Patrik Milán Veres, a PhD student in Astronomy at Ruhr University Bochum, which illustrates the challenges in the work of this young scientist.

Krzysztof Katarzyński
EVN Consortium
Board of Directors Chair

CALL FOR PROPOSALS

Observing proposals are invited for the European VLBI Network (EVN). The deadline for submission is 1 Jube 2026 at 16:00 UTC. The EVN facility is open to all astronomers; however, restrictions currently apply to teams with PIs and/or co-Is affiliated with institutes in Russia or Belarus. Astronomers with limited or no VLBI experience are particularly encouraged to apply for observing time, and student-led proposals are viewed favourably. Details of the call for proposals can be found here. Support with proposal preparation, scheduling, correlation, data reduction, and analysis is available from the Joint Institute for VLBI ERIC (JIVE) via usersupport@jive.eu.

SCIENCE HIGHLIGHTS

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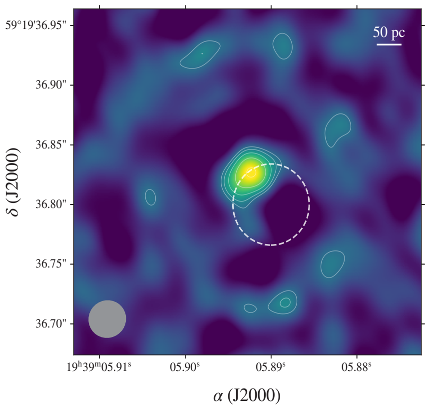

Pinpointing a repeating FRB to a compact radio source with the EVN

Alexandra Moroianu

The origins of FRBs remain a compelling open question in modern astrophysics. A small subset of FRBs (~3%) have been observed to repeat, enabling follow-up observations with VLBI to localise them with milliarcsecond precision. Using the EVN, we observed the repeating FRB 20190417A and, combining five bursts, achieved a localisation precision of ~5 milliarcseconds. Examining the continuum EVN image, we confirm that the burst is spatially coincident with a compact persistent radio source (PRS) first observed by Ibik et al. (2024). This marks the fourth confirmed FRB-PRS system. Read more.

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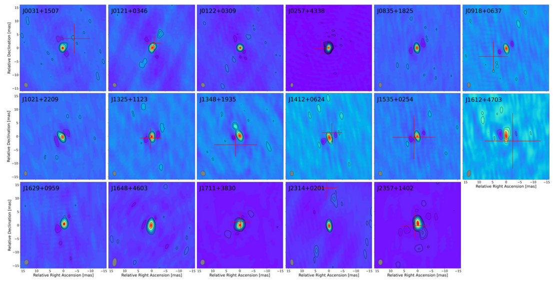

Milliarcsecond-resolution radio-imaging survey of blazar candidates at 4 < z < 5.4

Máté Krezinger

Unravelling how the earliest supermassive black holes (SMBHs) and their host galaxies formed and evolved remains one of the major open questions in modern observational cosmology. Quasars—powered by accreting SMBHs— at very high redshifts (z > 4) offer a direct observational window into the Universe's first billion years. Blazars (quasars with their jet oriented close to the line-of-sight) can be used to obtain a reliable and unbiased census of jetted active galactic nuclei (AGN), since their number is strictly related to the total number of jetted AGNs. Read more.

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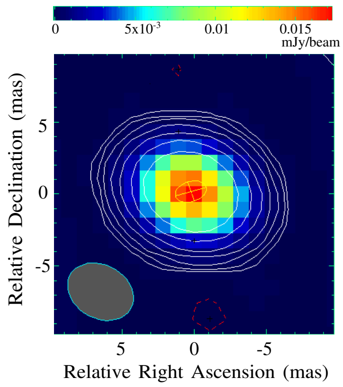

Back from the dead: AT2019aalc as a candidate repeating tidal disruption event in an active galactic nucleus

Patrik Milán Veres

Optical sky surveys have led to the discovery of several rare nuclear transients in galaxies whose nature is still not well understood. Here we present multi-wavelength monitoring of such a transient that occurred in a known AGN, but with unusual optical emission lines. These features allow us to classify the event as a Bowen fluorescence flare, a transient class that typically arises in pre-existing AGN yet is clearly distinct from standard AGN flaring activity. Using the EVN and the e-MERLIN, we detect a compact radio source with a brightness temperature exceeding the equipartition limit, indicating non-thermal, AGN-related emission. We also find that most known Bowen flares exhibit increasing late-time radio emission relative to their optical flares, similar to several tidal disruption events, which may provide an important clue to their origin. Read more.

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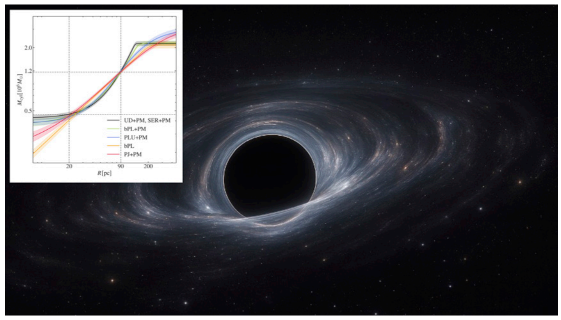

A challenge to cold and warm dark matter

John McKean

Dark matter forms a fundamental part of our Universe, yet we know very little about its properties. Although the large-scale structure of galaxies and clusters of galaxies in our Universe places some constraints on the nature of dark matter, it is on the smallest mass-scales (from a few million Solar masses to a few Jupiter-mass scales) that are proving to be the most informative. Since dark matter is not by definition luminous, studying its properties has proven to be very difficult. Therefore, astronomers use indirect methods that are sensitive to the presence of dark matter. Read more.

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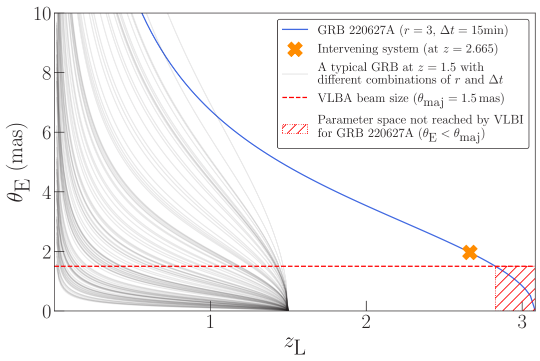


Was gamma-ray burst GRB 220627A gravitationally lensed or was it a rare “ultra-long” event?

James Leung

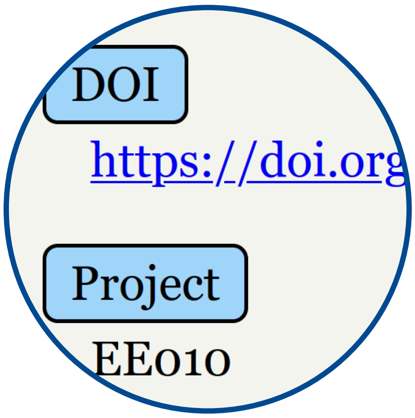
The gamma-ray light curve of gamma-ray burst GRB 220627A showed a double-pulse profile, with two pulses separated by a long period of quiescence lasting ~15 minutes. This led to speculation that the GRB light was bent by the gravitational potential of some foreground object(s), or lens, leading to different arrival times of the pulses from different paths. The time delay between pulses and the gravitational potential of lens studied from VLBI imaging can be used to provide independent measurements of cosmological properties such as the Hubble parameter. We carried out a world-first VLBI experiment to verify such a hypothesis. The results were inconclusive and highlighted the need for improved real-time correlation capabilities for time-domain science.
Read more.

OTHER NEWS

EVN datasets now receive DOIs

by Florian Eppel and Marjolein Verkouter

Citing datasets used in research publications is becoming standard practice. To support the EVN, JIVE joined the DataCite consortium. As a result, all datasets in the EVN Archive are now assigned Digital Object Identifiers (DOIs).

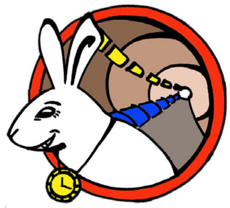


These DOIs enable persistent and reliable referencing of EVN data in research publications. To enable precise data citation, each EVN project is assigned a DOI and every observation within that project receives its own DOI. This allows authors to cite only the specific dataset(s) used in a publication or, alternatively, to use the overarching project DOI to indicate that all project data were used.

The implementation of DOIs enhances the visibility, traceability, and scientific impact of EVN data products, while ensuring proper credit for the observatory and contributing facilities. JIVE strongly encourages users to include the relevant DOIs when publishing results based on EVN data.

The Technical Operations and R&D group at JIVE played a significant role in the physical implementation of DOI assignment for datasets curated in the EVN Archive. While the "minting" of DOIs is straightforward, the issuing organisation must create the necessary internal infrastructure. This ensures that the metadata associated with each DOI is accurate and that an externally visible "landing page" is available for every DOI.

For example, clicking (or "resolving") the DOI https://doi.org/10.48717/ct5x-g528 directs your browser to the N25X3 landing page at https://evn-doi.jive.eu/observation/N25X3, supplying all metadata of the DOI, including a link to the actual data of this X-band Network Monitoring Experiment in the EVN Archive.



White Rabbit in Radio Interferometry

by Paul Boven

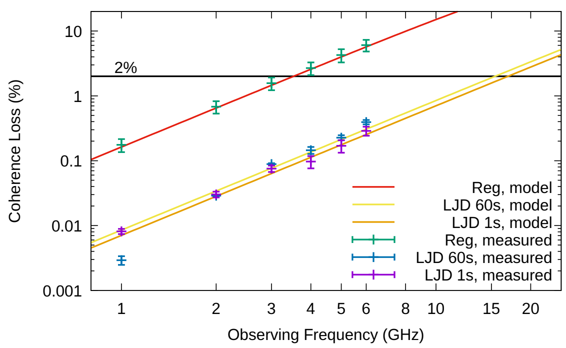
In VLBI arrays such as the European VLBI Network, every participating radio telescope needs a hydrogen maser atomic clock for sufficient phase stability. However, distribution of very accurate clock signals over glass fiber is also becoming a reality and is already in use at some EVN stations. We researched whether the "White Rabbit" system (an open hardware design developed by CERN) would be suitable for connecting radio telescopes, to support interferometers and even VLBI observations.

The graph shows our calculations and measurements of the loss in sensitivity (coherence loss) as a function of the observing frequency of the interferometer, when receiving its reference phase over a White Rabbit link. We show this for both the original ("regular") version of the White Rabbit switch, and the improved (LJD, Low Jitter Daughterboard) version, which clearly performs much better. The solid lines are our model, and the data points mark our direct measurements on a mock-up of a radio interferometer we built.

We find that regular White Rabbit switches would be good up to an observing frequency of about 3.5 GHz, whereas the low jitter version can support interferometers up to 15 GHz. Future implementations of White Rabbit are likely to perform even better.

We also verify these results by performing VLBI observations using the Dwingeloo radio telescope, connected by 169 km of fiber to the WSRT H-maser, and correlated against several other EVN dishes.

For more details, see our newly published paper: White Rabbit in Radio Interferometry, E. P. Boven e.a., published as open access in Experimental Astronomy.



Modeled and measured coherence loss due to a White Rabbit link

By Benito Marcote

Your science at the EVN seminars

The EVN online seminars continued in the first half of 2026 with talks on gravitational lenses by John McKean and novae by Rocco Lico, with more seminars planned for the second half. More information is available at evlbi.org/evn-seminars. Join the mailing list to stay updated on future events.

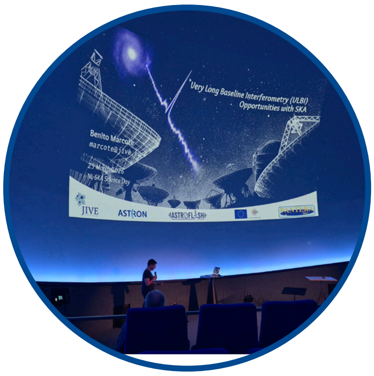


Photo: Ioanna Kazakou, JIVE

SKA-VLBI opportunities at the Dutch SKA Science Meeting

At the Dutch SKA Science Meeting in Groningen, EVN support scientist Benito Marcote presented why VLBI is crucial in the SKA era. Read the key points of his talk in JIVE's LinkedIn post.

By Benito Marcote

EVN online training days

JIVE scheduled two training days on 22 and 29 April under the ACME project to showcase what the EVN can do for your science and how to submit successful observing proposals, prepare schedules, and receive support from the JIVE team. More information at evlbi.org/training-2026 or in JIVE's LinkedIn post.

ACME project updates

By Zsolt Paragi, co-lead of ACME Work Package 3

The Astrophysics Center for Multi-messenger studies in Europe (ACME) is an EU-funded project which aims to implement the APPEC and ASTRONET recommendations of the European roadmaps and act as a pathfinder to broaden, improve and align access to the respective research infrastructure services and data, and assess and evaluate new models for better coordination and delivery of services at scale. It provides harmonised and inclusive transnational (TA) and virtual (VA) access to world-class Research Infrastructures. In the project we formed six Joint Centres of Expertise (JCEs) in various domains, each of which has a number of nodes. The radio domain is a virtual network of Effelsberg, Jodrell Bank Observatory, ASTRON, and JIVE, each supporting users of these instruments and engaging in training activities.

The central portal of ACME JCEs was kick-started in September 2025. Through this portal, researchers may apply for 1—2 weeks TA visits to ACME institutes, preferably in a domain different from their own expertise. There are two TA visit calls each year. This program is highly successful, with a large number of visits carried out in the past year. There is also the VA portal, where registered users can consult experts remotely. We would like to encourage everyone to make use of this new service, because users may receive invaluable help from the leading multi-messenger experts in the field. The JCE nodes also organise online training sessions. Please check out the program and sign up here.

We had a busy start in 2026. On 19—20 January, the ACME Research Infrastructures Forum took place in Milan, Italy. We discussed the status of the project and the challenges ahead. Some members of our newly established ACME Science Advisory Board (ASAB) were also present. The two largest work packages, responsible for TA and VA support for instruments and users, met on 18—19 February in L'Aquila, Italy. This brought together Work Package and JCE leaders, along with JCE node experts, to discuss the provision of access, to explore how we could improve and broaden our services. Ideally, the project aims at connecting astroparticle physicists and astronomers working in different domains, by sharing expertise and data. But this is not always straightforward. We are looking into further streamlining access provision and perhaps continue these activities even beyond the lifetime of ACME. For now, however, we must focus on the first reporting period, as we approach month 48 of the project.

Radioblocks updates

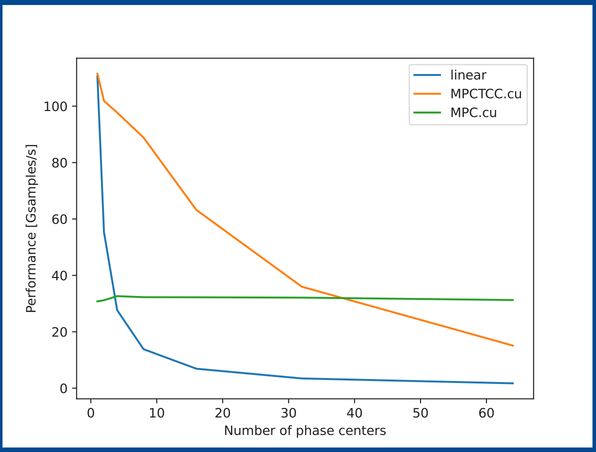
by Marjolein Verkouter

Within the RADIOBLOCKS project, JIVE delivered two new GPU-based processing modules relevant for VLBI arrays such as the European VLBI Network (EVN).

A new work was submitted in February 2026, comprising a document and software modules, entitled “Beamforming and Coherent Dedispersion Modules”.

The modules integrate with, and extend, the GPU version of the SFXC VLBI correlator by adding an efficient Multiple Phase Center (MPC) post-processing “block” for wide-field VLBI applications, as well as enabling the unique science capability of applying coherent dedispersion for pulsar and Fast Radio Burst (FRB) VLBI observations.

Performance of two variant implementations of GPU-accelerated MPC processing in Gsamples per second; linear performance scaling (blue line) is shown for comparison. Both MPC “blocks” share the same application programming interface and can be easily switched, allowing selection of the most performant implementation for a given number of phase centres.



MPC processing is an efficient technique for generating manageable datasets for multiple sources within the field of view of VLBI telescopes. It works by reprocessing high time- and frequency-resolution correlated data and integrating per phase center before writing the data to disk.

Coherent dedispersion is a technique in which the frequency-dependent delay of a pulsar or FRB signal can be removed from high time- and frequency-resolution data after correlation, but before the data are written to disk. This allows the pulse signal to be coherently added in frequency and time, thereby improving the signal-to-noise ratio.

In investigating the impact on SFXC-GPU performance and energy efficiency when including either of the new modules in the correlation process, the authors concluded that "we can retain the significant gains described in Deliverable D4.4 for these metrics" (see "Basic correlator on TensorCore architecture" for the impressive performance of the Tensor-Core-based correlator).

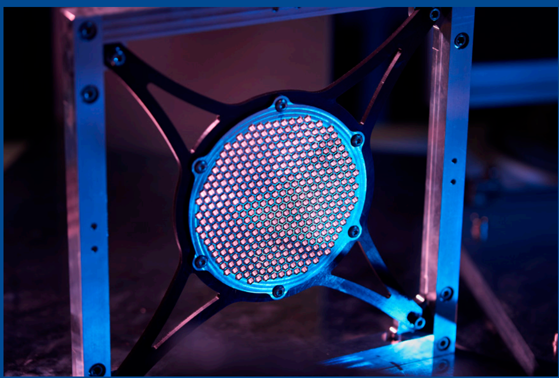
This work has benefited significantly from close collaboration and knowledge sharing between the partners in Work Package 4, which focuses on data transport and correlation.

FROM THE STATION

Enabling Transformative Tri-band VLBI Observations at Onsala

By Jun Yang, Senior VLBI Support Scientist and Research Engineer, and Robert Cumming, Communications Officer, Onsala Space Observatory, Chalmers University of Technology

Chalmers University of Technology, Sweden, has received 13 million SEK (approximately 1.2 million euros) from the Hasselblad Foundation to support the Tri-band Camera Project at the Onsala Space Observatory. The three-year project aims to develop an advanced tri-band receiver and to upgrade instrumentation on the Onsala 20-m radio telescope, enabling cutting-edge research. The major system upgrade will allow the Onsala station to participate in simultaneous tri-band VLBI observations at 22, 43, and 86 GHz with the EVN and the GMVA. Combined with the novel calibration technique of frequency phase transfer, this VLBI capability will enable astronomers to study much fainter jets, supermassive black holes, and other cosmic phenomena with a very high imaging resolution.



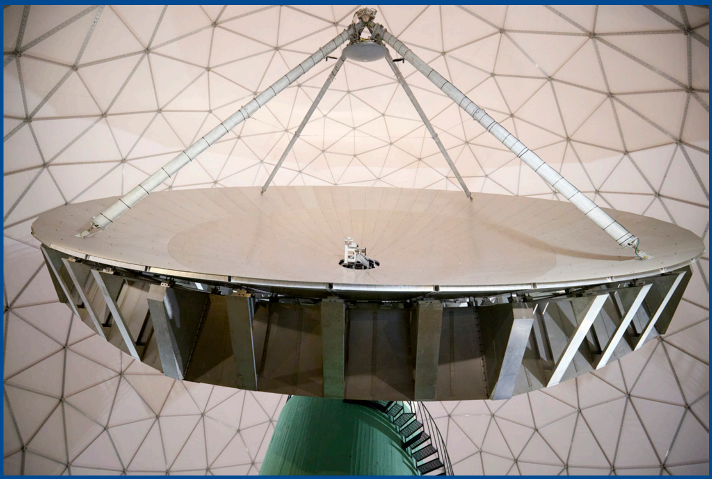
The camera's innovative dichroic in the lab. Longer radio waves reflect from this special surface, while shorter ones pass straight through. The component's honeycomb pattern makes it possible for the camera to work with polarised radio waves, which can reveal magnetic fields near black holes, for example. **Photo**: Chalmers/Anna-Lena Lundqvist

Over the past decades, simultaneous VLBI observations using tri band receivers at millimeter wavelengths—pioneered by the Korea VLBI Network (KVN)—have demonstrated significant technical advantages for frontier science. Such tri band observations allow accurate tracking of tropospheric phase variations at lower frequencies, which can then be transferred to higher frequencies by scaling phase solutions according to the frequency ratio. Through this frequency phase transfer calibration, the phase coherence time of visibility data can be increased by a factor of 100 or more, for example from approximately 10 seconds to about 1000 seconds at 86 GHz on the baselines to Onsala.

The tri-band VLBI system has long been identified as a strategic priority in the long-term development plan of the Onsala Space Observatory (OSO). Within OSO's Group for Advanced Receiver Development (GARD), key components for tri-band receivers—dichroic filters—have already been successfully developed. In addition, discussions on the overall system specifications and possible designs have been ongoing since 2022.

With the funding, OSO will develop a compact tri band receiver with frequency coverages well matched the EVN and GMVA requirements. The compact design enables all critical components to be cooled in a single cryogenic enclosure, thereby minimizing their noise contributions and improving system phase stability. The chopper wheel calibration will be implemented to enable accurate VLBI amplitude calibration using opacity corrected system temperature measurements. Furthermore, OSO will upgrade its intermediate frequency (IF) system, procure a broadband backend, and design a mechanical system for automatic receiver switching.

The upcoming VLBI system will significantly enhance the Onsala station's capabilities by increasing both observing bandwidth and frequency agility. Once operational, Onsala will be able to conduct VLBI observations at a total data rate of up to 128 Gbps. Receiver switching times will be reduced to a few seconds, enabling rapid frequency changes for various VLBI observations with the 20-m telescope at X, K, Q and W bands.



The 20-metre telescope in Onsala, Sweden, will celebrate 50 years of operation in May 2026. The parabolic mirror, 20 meters across, is protected from the weather by a round, white dome with triangular segments. The new camera is placed behind the centre of the dish. **Photo**: Chalmers/Anna-Lena Lundqvist

Q & A

We spoke with Patrik Milán Veres, PhD student in Astronomy at Ruhr University Bochum, and asked him a few questions about the paper featured in this issue. We also discussed the challenges and prospects of multi-band and multi-messenger approaches, as well as how he sees their role for young scientists.

What are the key results of this study?

In this work, we studied the re-brightening of the nuclear transient AT2019aalc. We find that the optical spectra show emission lines produced by the Bowen fluorescence mechanism. These lines trace extreme UV radiation and, while predicted decades ago, are only rarely observed as strong features in AGN spectra. Such cases with accompanying optical flares are now classified as Bowen fluorescence flares. Interestingly, Bowen lines are more commonly associated with TDEs, which are typically found in previously dormant galaxies. In contrast, AT2019aalc occurred in a known AGN. Combined with other TDE-like signatures, this suggests that AT2019aalc can be interpreted as a TDE in an AGN. The re-brightening further supports a repeating partial TDE scenario, where a surviving stellar core returns for a second interaction. In addition, our radio analysis reveals a delayed radio flare relative to the optical emission. Our EVN observations allowed us to characterise this radio emission, pointing to a newly ejected outflow component, likely triggered by the enhanced accretion associated with the TDE.

What are the main challenges in combining multi-band and multi-messenger observations?

Combining multi-band observations with multi-messenger observations introduces a few notable challenges. For example, apparent associations may occur by chance given that hundreds of AGN can lie within a single neutrino localisation region. Even if we assume that an AGN is responsible for the neutrino emission, identifying the true counterpart remains challenging. Therefore, it is essential to connect theoretical expectations (which types of sources can produce neutrinos?) with the observed properties of our candidates.

What are the future prospects of multi-band and multi-messenger approaches?

Future neutrino detectors will not only detect more neutrinos but are also expected to provide improved angular resolution. At the same time, sensitive sky surveys such as the Vera C. Rubin Observatory LSST and LS4 will uncover a large number of candidates, potentially including previously unidentified source populations, for example high-redshift objects. Moreover, the case of Bowen flares shows that new transient classes continue to be discovered, some of which may be linked to multi-messenger phenomena. I think that, despite the large amount of data, it will remain very important to study individual transient events in detail. Looking back at past predictions and older studies will also be essential in the future, regardless of the data volume.

How will this field shape opportunities for early-career astronomers?

Without a doubt, new multi-band sky surveys will provide a wealth of data and a large number of transients. We will need to identify these events, conduct follow-up observations often coordinated with multi-messenger detectors, perform data analysis and interpret the results. These are areas where early-career astronomers can make important contributions. Despite its challenges, time-domain astrophysics is a dynamic field that offers early-career astronomers great opportunities to develop important observational and analytical skills across all wavelengths.

UPCOMING EVENTS

European Astronomical Society 2026 Meeting

Lausanne, Switzerland. Registration deadline: 28 June 2026. For more information, click here.

URSI GASS 2026

Kraków, Poland, from 15 to 22 August 2026. Early-bird registration is open until 5 June 2026. For more information, click here.

ERIS 2026

INAF Institute of Radioastronomy (IRA-INAF), Noto, Sicily, from 7 to 11 September 2026. Registration is closed. For more information, click here.

The 17th European VLBI Network Symposium and Users' Meeting

Jodrell Bank Centre for Astrophysics (University of Manchester, UK), from 14 to 18 September 2026. Abstract submission is closed. Registration is open until 1 September 2026. For more information, click here.

AGN on the Beach II

Diani, Kenya, from 21 to 25 September 2026. Early-bird registration is open until 30 May 2026, and registration closes on 20 July 2026. For more information, click here.

ngVLA International Science Symposium 2026

Sendai, Japan, from 10 to 13 November 2026. For more information, click here.

YERAC 2026

Astrophysics, University of Oxford, from 17 to 21 August 2026. Registration is closed. For more information, click here

Get in touch

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Our email

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